Title: Super Serapes

Brief Overview:

This unit is a summative assessment of polygons, transformations, patterns, area, perimeter, and fractions. The children will be engaged in the creation of a serape (Mexican shawl) where they will design a pattern using transformations of polygons. The children will measure the polygons, and the serapes will be used to find fractional relationships.

Links to NCTM 2000 Standards:

- **Standard 1: Number and Operation**
  Mathematics instructional programs should foster the development of number and operation sense so that all students understand fractions, ways of representing fractions, and relationships among fractions and decimals; understand the meaning of fractions and how they relate to decimals; and use computational tools and strategies fluently in converting fractions to decimals.

- **Standard 2: Patterns, Functions, and Algebra**
  Mathematics instructional programs should include attention to patterns, functions, symbols, and models so that all students understand various types of pattern relationships; and use mathematical models and analyze transformations in real context.

- **Standard 3: Geometry and Spatial Sense**
  Mathematics instructional programs should include attention to geometry and spatial sense so that all students recognize the usefulness of transformations and congruency in analyzing mathematical situations; and use visualization and spatial reasoning to create patterns.

- **Standard 4: Measurement**
  Mathematics instructional programs should include attention to measurement so that all students understand area and perimeter; and apply a variety of techniques, tools, and formulas for determining area and perimeter.

- **Standard 6: Problem Solving**
  Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students apply a wide variety of strategies to solve problems involving patterns, area, perimeter, and fractions; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 8: Communication**
  Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others through paragraph writing and friendly letters; express mathematical ideas coherently and clearly to teachers and another adult; and use the language of mathematics as a precise means of mathematical expression in describing the pattern the student has created.

- **Standard 9: Connections**
  Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among fractions and decimals; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in art and clothing from other countries.

Grade/Level:

Grades 3-5

Duration/Length:

Four class days

Prerequisite Knowledge:

Students should have an understanding of the traditional clothing of Mexico and a working knowledge of the following math skills:

- Congruency
- Polygons
- Patterns and transformation
- Area and perimeter
- Fractions and decimals

Student Outcomes:

Students will:

- create patterns within serapes using congruent polygons.
- find the area and perimeter of the polygon(s) within the serape.
- describe their patterns within the serape in writing using mathematical terms.
- record the fractional relationships within various serapes.

Materials/Resources/Printed Materials:

- Student Resources
- Teacher Resources
- Various colors of construction paper
- Tagboard, index cards, or card stock
- Butcher paper cut 10 " X 3 ' per child
- Scissors
- Glue
- Centimeter rulers
- Centimeter paper or cubes

Development/Procedures:

Day 1 - Approximately 60 minutes

- Warm Up: Show students two groups of shapes. The groups should be sorted by polygons and non-polygons (See Teacher Resource 1.). Elicit from children the differences in the two groups and a definition of a polygon. (A polygon is a three or more sided closed figure constructed with straight paths.) *Allow 5 minutes for this activity.*
- Students will view Teacher Resource 2, which can be handed out to each student or shown on an overhead. Elicit from the children patterns they find within the serapes. Look for the students to see color patterns and transformation patterns (flips, turns, slides) within the congruent polygons on the serape examples. *Allow 10 minutes for this activity.*

- Use the remainder of the class time on the following activity.
- Have students read the prompt with a partner, then hold a class discussion to clarify what the prompt is asking the students to do.
- Students will decide on 1 or 2 congruent polygon(s) for their template(s). Have them create their template(s) for the polygon(s) they chose on tagboard, index cards or card stock. (Because the templates do not change, the polygons created from them will need to be congruent. Be sure to point this out to the children by questioning why the templates will automatically create a congruent shape. It's logical reasoning.) The templates should be approximately the size of a 3 X 5 card. The children will use the templates to cut out the polygons for their serapes on Day 2. Have students put their names on their template(s) and collect.
- Leave at least the last 15 minutes of class for Task 1, or assign for homework.
- Students should read Task 1 on their own, highlight key words in the directions and complete Task 1 on their own.

Day 2 - Approximately 60 minutes

- Warm Up: Review the patterns within the examples created by the teacher (See Teacher Resource 2.). Identify with the children the opening pattern sequence, known as a unit pattern, in the serapes in Teacher Resource 2. For example, in the first serape, the patterns are red, yellow/ triangle, square. Triangle and the square together slide to the next position. In the second serape, the patterns are purple, orange, blue, red, and the pentagon is transformed by the use of a turn. In the third serape, the patterns are green and orange triangles that are flipped. *Allow up to ten minutes.*
- Students will review their selected personal pattern. Have the students take a gallery walk to see the patterns created by their classmates. (Gallery walk: students leave their work on their desk face up and walk around the room in an organized fashion viewing other students' patterns in an appropriate manner) *Allow up to ten minutes.*
- Read Task 2 with the students. Task 2 is the creation of the serape. Before the students create their serapes, elicit from the students the criteria that should be met for an excellent serape in the form of a rubric (See Teacher Resource 3.). (Excellent serapes are completed neatly and should have exactly 10 appropriately spaced polygons with an identifiable pattern.) *Allow up to ten minutes.*
- Pass out student templates from Day 1. Refer the students to the pattern they created in Task 1. Next, they need to gather the materials (construction paper, scissors) needed to create the polygons for their serape. With their templates, the children need to trace and cut out the polygons in the colors they chose previously in Task 1. Again, students need to have 10 total polygons on their serape. Independently, have the students refer to the rubric before they glue their polygons to their serape. (If necessary, before students glue their polygons to their serape, they can check with their teacher.)
- Students will write an informative paragraph describing their pattern. Show children the writing rubric before beginning the task . Again, see Teacher Resource 3. This is student Task 3. Some of the mathematical terms to look for in the paragraphs are congruent, flip, slide, turn, polygon, pattern, triangle, rectangle, etc.
- (Re-collect student template(s).) *Allow up to thirty minutes.*
- Collect the serapes and place them in a safe area to dry.

Day 3 - Approximately 60 minutes

- Before beginning, have serapes hung in room so they are all visible to children but don't dominate room. Be sure that you number the serapes and those numbers are visible on each serape. It is suggested that you use post-its so as to not damage the children's work.

- Warm Up: Review fractional terminology including decimals. Again using the serapes in Teacher Resource 2, decide the fractional relationships for a few of them. For example, in the third serape (opening pattern sequence: green/orange triangles), 10/10 (ten-tenths) or 1.0 of the polygons used are triangles; and 5/10 or .5 are green and 5/10 or .5 are orange. In the fourth serape (opening pattern sequence: two orange triangles-one red rectangle), 7/10 (seven-tenths) or 0.7 of the pattern used orange polygons. In the last serape (opening pattern sequence: orange-blue-red/ triangle, pentagon, rectangle), 3/10 (three-tenths) or 0.3 of the polygons are pentagons. Be sure you identify why the denominator will never change. The opening pattern sequence will not change unless you have a different sheet. *Allow up to fifteen minutes.*
- Students will demonstrate knowledge of fractions by finding a minimum of two fractional relationships in 1-3 serapes. Students are now on Task 4, Student Resource 4. First, each child selects a serape from the entire class collection. Then, s/he will interpret its opening sequence pattern and record it. Next, s/he will write down one of the fractional relationships in that serape. Then, that fraction is converted to a decimal. Finally, s/he must explain in mathematical terms how that fraction was created (e.g., "I know the denominator of this fraction is ten because there are ten total shapes in the set. I know the numerator is six because six of the shapes are pentagons.) The teacher can ask for as much detail as is appropriate for his or her classroom. Also, a child can do more than one of these tasks. *Allow up to twenty minutes.*
- Review concepts of area and perimeter. (Generate some of your own polygons on an overhead or chalkboard. Ask children to tell you how it is possible to measure both the inside and outside of these shapes. Ask them what the mathematical term for the measurement of the inside and outside of a shape is.) *Allow up to ten minutes.*
- Students will, with their template(s), measure the area and perimeter of their polygon(s). Review strategies that are the most appropriate for the class. You may want to allow square centimeter paper, centimeter cubes or formulas to discover the area. For example, if the students need to use the square centimeter paper, they can place the template(s) down upon the paper, trace it (or them) and then count the blocks (and half blocks).
  To find perimeter, the children will need centimeter rulers. Demonstrate with a meter stick on the board to model this measuring. *Allow up to ten minutes.*

Day 4

- Students will write a friendly letter to the recipient of their serape explaining how they created their serape. Before handing out Student Resource 6, show the writing rubric on the board for the children. Leave the rubric on the board during the time the children are writing the letter. Elements of a friendly letter are on Student Resource 6. Please refer to it. Also show Teacher Resource 3.

Performance Assessment:

Students will be assessed on the following:

- Creating congruent polygons
- Identifying transformations
- Finding area/perimeter
- Locating the fractional relationships within the serape design
- Writing about the serape

Extension/Follow Up:

- NCTM 2000 Standard 5: Statistics and Probability.
  These serapes allow for graphing a great amount of information. The type of graph you create in your classroom is up to you. On the X-axis (or the Y-axis of a pictograph) of your graph you can list any of the following types of information: types of polygons used, colors used, patterns involving one polygon, (two polygons, etc.), patterns involving one color, (two colors, etc.), or patterns that use flips, and/or turns, and/or slides. Have children analyze the data created from the class graph looking for trends, differences, etc.
- Read A New True Book: Mexico and locate the use of serapes in the text.
- Using the Postcard series C-D ROM, as a center or independent study program, search for serape use.
- With a digital camera, "film" all the serapes and create a slide show using the Kid Pix software. This can be your Serape Gallery.

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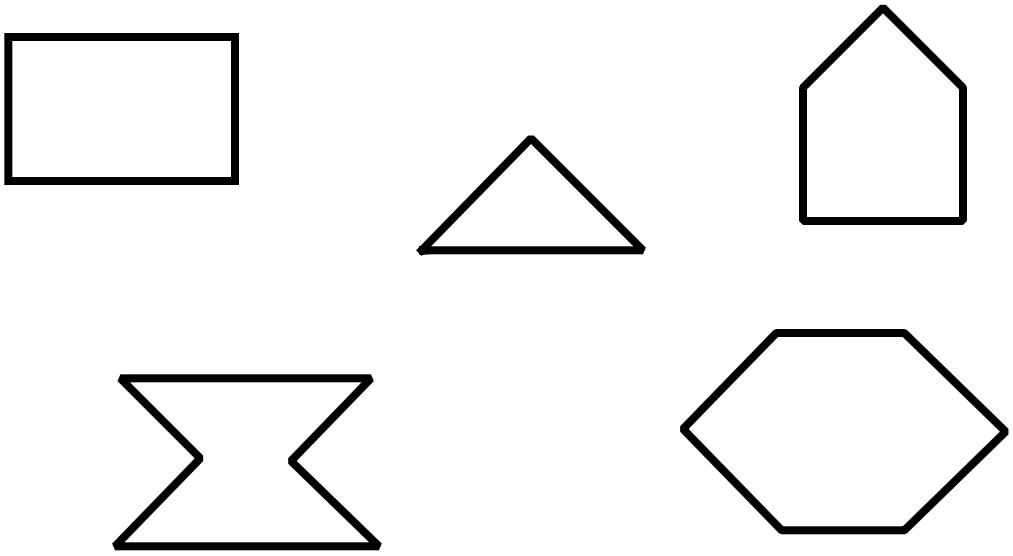
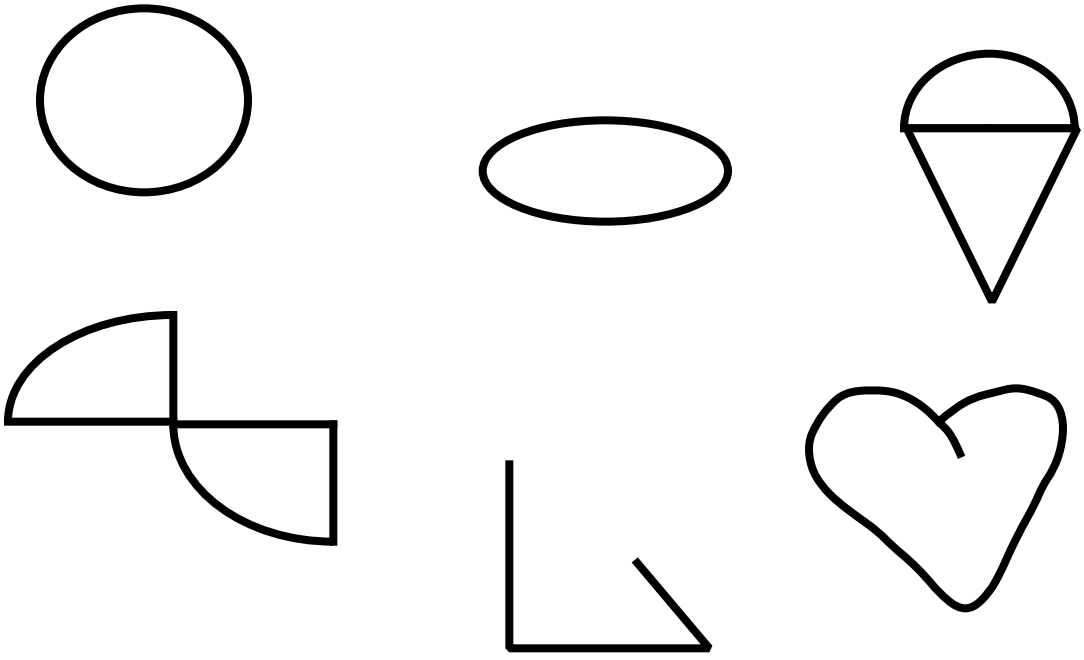
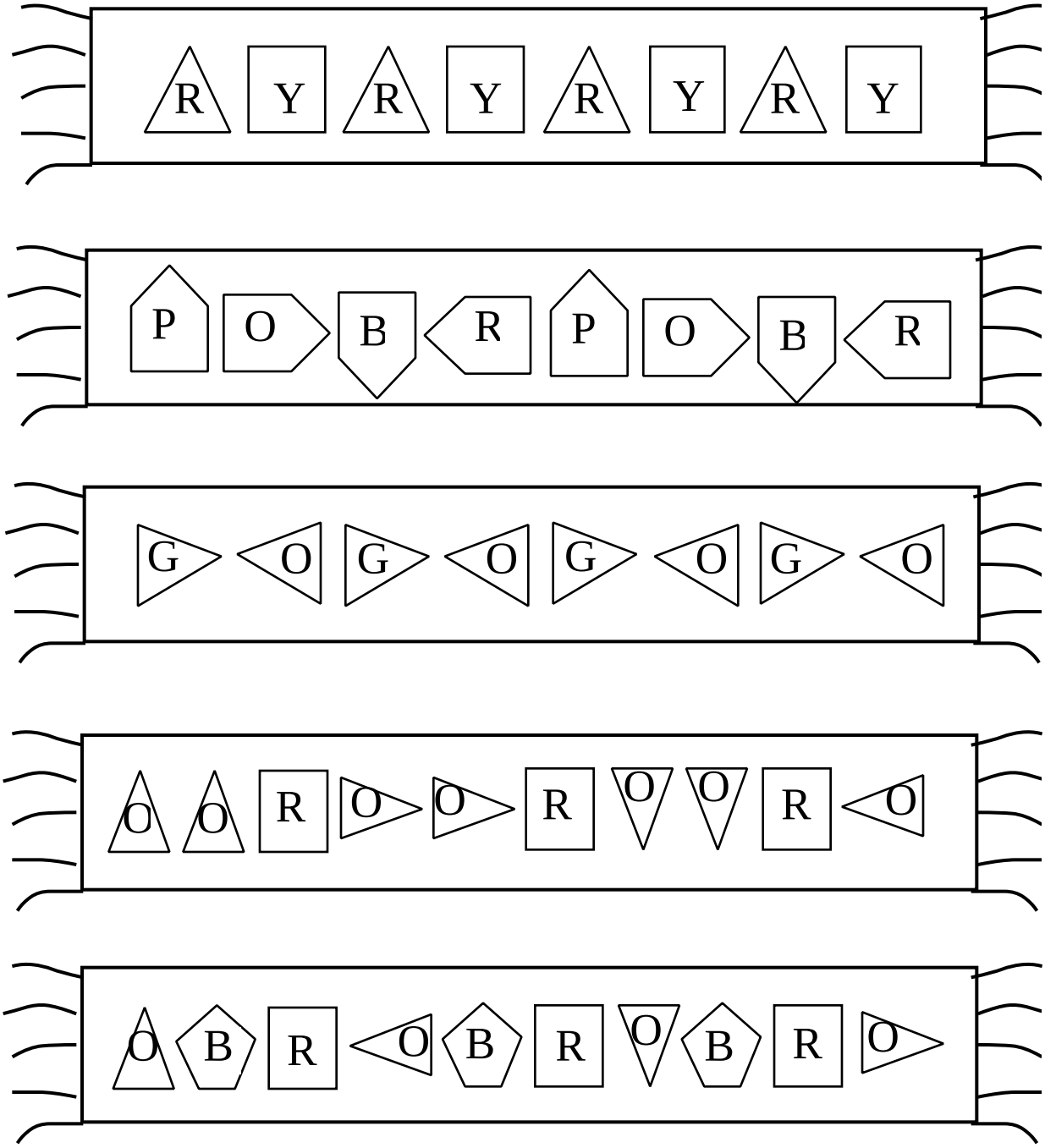
Polygons



Non-Polygons



Super Serape Examples



SCORING RUBRICS

SERAPE RUBRIC

2 - Completed neatly
10 appropriately spaced polygons
Shows an identifiable pattern

1 - Completed
10 spaced polygons
Shows a pattern

0 - Less than 10 polygons
No pattern

WRITING RUBRIC

2 - Writing shows proper form.
Writing shows excellent use of grammar, spelling, punctuation, and language.
Writing shows excellent understanding of mathematical vocabulary.
Writing clearly answers prompt.

1 - Form of writing is not exact.
Writing shows some good use of grammar, spelling, punctuation, and language.
Writing uses mathematical vocabulary.
Writing addresses prompt.

0 - Student attempts to answer question.

A traditional article of clothing in Mexico is a serape. The serape is a hand-woven shawl. The ones we have seen all have congruent polygons that create individual patterns.

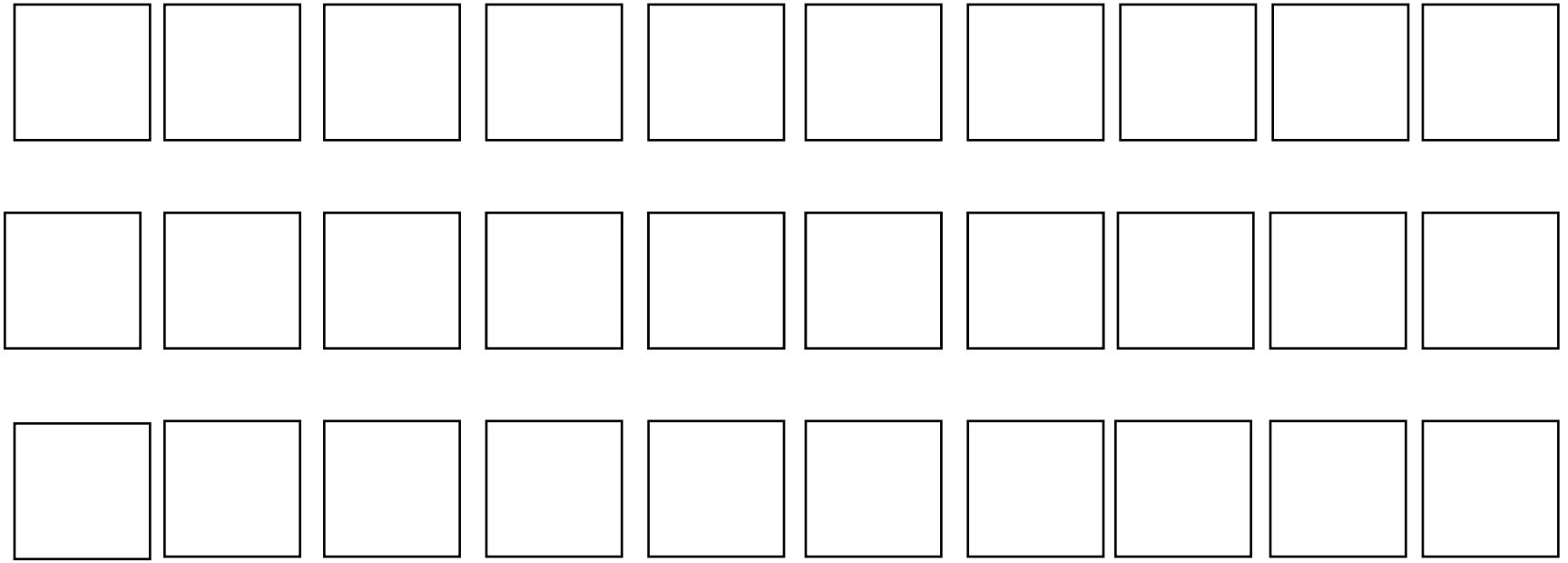
In this task, you are going to manipulate congruent polygons to create a beautiful pattern. You will use this pattern to create a serape for an adult in our school. We will then discover the fractional relationships of the polygons within the serapes, as well as the area and perimeter of the polygons. You will be writing informative pieces to a variety of audiences about your serape.

Task 1:

Name:

Date:

In the space below, please create a series of patterns with your polygon(s). Be sure you have ten (10) polygons going left to right in a variety of colors [two (2) minimum]. When you have created at least three (3) different patterns, circle your favorite one. This pattern will go on your serape.



Note: These patterns you create will not be to scale. Draw them to the best of your ability.

Name:
Date:

Task 2
Use the necessary materials to create your serape on the large paper.

Task 3
In a paragraph, inform your teacher about the pattern you created on your serape. Be sure you use correct spelling, punctuation, and grammar. Use at least three (3) mathematical terms to describe your pattern. Explain what steps you used in creating your pattern. (Remember that your serape will have more than one pattern.)

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Task 4

Name:
Date:

Select one serape from those displayed around the classroom to analyze. What number did you choose? _____

First, write three (3) fractions showing relationships between colors or shapes within the pattern on the serape.

Next, convert the fractions to decimals.

Last, explain in mathematical terms how you constructed your fractions and what relationship they show.

Opening Pattern Sequence	Fraction	Decimal	Explanation

Task 5

Name:

Date:

Select a template and use one of the methods we have learned in class to find its area and perimeter. Record and explain your data below.

Area = _____	Perimeter = _____

Draw and label your template.

Task 6

Name:
Date:

Super Serape Letter

Today you will write a friendly letter to the adult to whom you are giving your serape. Be sure to use the proper form and include all five (5) parts of a friendly letter (date, greeting, body, closing, signature). Tell the adult the procedure you followed to create your serape and why you are giving him or her this beautiful serape.

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Task 6 (continued) Name: